Smart Regenerative Charging

The largest element of the Smart Regenerative Charging Strategy is stored in the BCM module. It receives all of the important information relating to the battery condition sent by the battery monitoring sensor via the LIN (local interconnect network) data bus.

The information obtained is used to calculate the required set value for generator charge voltage. This is sent by the BCMto the PCM via the HS-CAN (controller area network) data bus. This then adjusts the value received if necessary and passes it on the generator via the LIN data bus. The charging voltage is adjusted depending on various parameters, such as the current level of engine efficiency.

The smallest possible set value for the generator voltage is 12.2 V, while the maximum charging voltage may be anywhere between 14.5 and 14.9 V.

However, when the battery is in a refresh phase, the voltage may occasionally reach up to 15.2 V. These refresh phases are required as the battery charge status is 80% over long periods of time, which increases the risk of sulfation in the cells.

Comparison of Smart Regenerative Charging and Conventional Charging

The diagram below demonstrates the difference between Smart Regenerative Charging and Conventional Battery Charging.

Conventional charging aims to charge the battery to the highest possible levels. During this process the battery temperature is monitored and the battery must not be overcharged.

By comparison, Smart Regenerative Charging uses the information from the battery monitoring sensor to maintain the battery at a calibrated state of charge (approx. 80%) at all times. This means that the battery has a certain amount of extra charging capacity at all times.

If the battery monitoring sensor detects that the charge status is above the calibrated value (approx. 80%), then the generator charging voltage is reduced in order to discharge the battery. If the opposite occurs and too low a value is detected, the charging value is increased in order to return the battery to the calibrated value.

Battery Monitor Sensor

The Battery Monitor Sensor measures temperature, voltage and current throughput of the battery. It uses this information to calculate the battery SOC (State of Charge).

To function with high accuracy, the Battery Monitor Sensor must be recalibrated at regular intervals.

A recalibration occurs during a rest period when the battery quiescent current is less than 100mA.

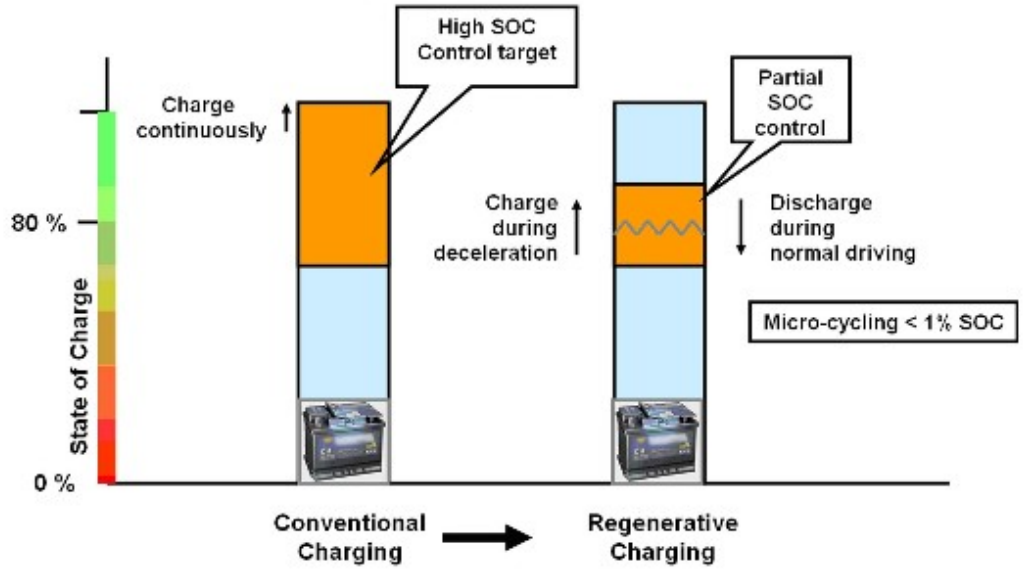
This rest period must last for at least 3 hours.

The longer the rest period, the greater the accuracy.

The timeframe in which a recalibration must take place is seven days.

If the system has been unable to carry out a recalibration within 7 days, the SOC accuracy cannot be guaranteed.

This will result in the Start – Stop and SRC systems being deactivated.



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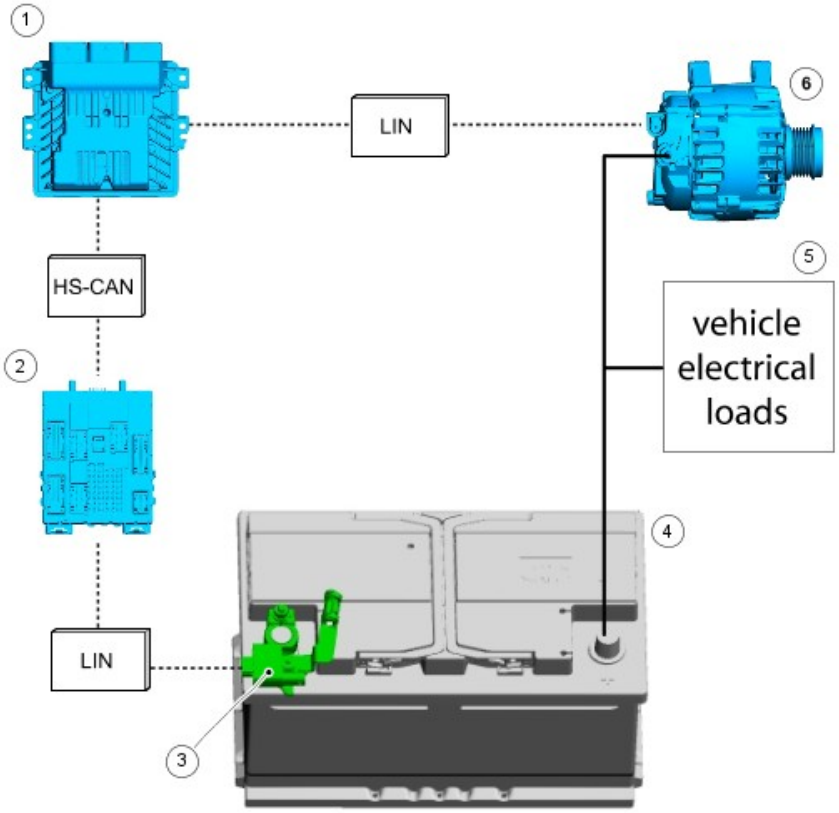
Description and Operation

System Diagram



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Item	Description
1	PCM (powertrain control module)
2	BCM (body control module)
3	Battery monitoring sensor
4	Enhanced Flooded Battery
5	Electrical consumers
6	Generator